

THAT WHICH IS CLAIMED:

1. An apparatus for maintaining an aircraft, the apparatus comprising:

a mobile base having a plurality of wheel members for allowing said mobile base to travel along surfaces and a plurality of support surface registering members for registering said mobile base to a support surface to inhibit movement of the plurality of wheel members;

a boom member having a proximal end portion rotatably mounted to said mobile base, said boom member being movable between a retracted position and an extended position; and

an aircraft maintenance tool connected to a distal end portion of said boom member.

2. An apparatus as defined in Claim 1, wherein said mobile base includes a plurality of fluid tanks for supplying fluid to the maintenance tool.

3. An apparatus as defined in Claim 1, wherein each of the plurality of wheel members includes an omni-directional vehicle wheel for providing at least forward, lateral, diagonal, and rotational motion of said mobile base.

4. An apparatus as defined in Claim 1, wherein said mobile base includes a rotatable platform positioned along an upper end portion thereof, and wherein said boom member includes a first boom arm having a proximal end portion pivotally connected to the rotatable platform of said mobile base and having a retracted position and an extended position, a second boom arm having a proximal end portion mounted to said first boom arm and having a retracted position and an

40530-0400

10 extended position, and a third boom arm having a medial portion pivotally mounted to the distal end portion of said second boom arm and having a retracted position and an extended position.

5. An apparatus as defined in Claim 4, wherein said boom member further includes a fourth boom arm having a proximal end portion rotatably mounted to a distal end portion of said third boom arm.

6. An apparatus as defined in Claim 5, wherein said fourth boom arm includes a plurality of arm links, the plurality of arm links including a first arm link having a proximal end rotatably connected to the distal end portion of said third boom arm, a second arm link having a proximal end pivotally connected to the distal end of the first arm link, a third arm link having a proximal end portion pivotally connected to the second arm link, and a fourth arm link having a proximal end rotatably connected to the distal end of the third arm link.

7. An apparatus as defined in Claim 1, said plurality of support surface registering members each include a support surface contact member and a hydraulic engaging member connected to the support surface contact member for hydraulically engaging the support surface contact member with the support surface.

8. An apparatus as defined in Claim 1, wherein said aircraft maintenance tool includes at least one of the following: an aircraft deicing tool and an aircraft cleaning tool.

40052730 "011502  
20052730 "011502

9. An apparatus as defined in Claim 8,  
wherein said aircraft cleaning tool includes a tool  
housing, a pair of cleaning brushes having at least  
portions thereof mounted in said tool housing, and  
5 driving means connected to said tool housing for  
rotatably driving said pair of cleaning brushes in  
opposite rotational directions.

10. An apparatus as defined in Claim 1,  
wherein said mobile base includes rotating means for  
providing rotational movement of said mobile base on a  
support surface, wherein said boom member is rotatably  
5 connected to said mobile base, and wherein said  
maintenance tool is rotatably connected to said boom  
member.

11. An apparatus as defined in Claim 1,  
wherein said mobile base further has an operator cab  
for operating the apparatus from said mobile base.

12. An apparatus for maintaining a transport  
vehicle, the apparatus comprising:

a mobile base mounted to said transport  
vehicle and being readily separable from said transport  
5 vehicle;

a boom member having a proximal end portion  
rotatably mounted to said mobile base, said boom member  
being movable between a retracted position and an  
extended position; and

10 an aircraft maintenance tool rotatably  
connected to a distal end portion of said boom member.

13. An apparatus as defined in Claim 12,  
wherein said mobile base includes rotating means for

405233-0150

providing rotational movement of said mobile base on a support surface.

14. An apparatus as defined in Claim 13, wherein said rotating means of said mobile base includes a plurality of wheel members each having an omni-directional vehicle wheel for providing at least forward, lateral, diagonal, and rotational motion of said mobile base.

15. An apparatus as defined in Claim 14, wherein said mobile base includes a plurality of fluid supply tanks for supplying fluid to the maintenance tool, a power source, and at least one pump connected to said power source and positioned in fluid communication with said plurality of fluid tanks for pumping fluid to the maintenance tool.

16. An apparatus as defined in Claim 15, wherein said mobile base includes a rotatable platform positioned along an upper end portion thereof, and wherein said boom member includes a first boom arm having a proximal end portion pivotally connected to the rotatable platform of said mobile base and having a retracted position and an extended position, a second boom arm having a proximal end portion mounted to said first boom arm and having a retracted position and an extended position, and a third boom arm having a medial portion pivotally mounted to the distal end portion of said second boom arm and having a retracted position and an extended position.

17. An apparatus as defined in Claim 16, wherein said boom member further includes a fourth boom

arm having a proximal end portion rotatably mounted to a distal end portion of said third boom arm.

18. An apparatus as defined in Claim 17,  
wherein said fourth boom arm includes a plurality of  
arm links, the plurality of arm links including a first  
arm link having a proximal end rotatably connected to  
5 the distal end portion of said third boom arm, a second  
arm link having a proximal end pivotally connected to  
the distal end of the first arm link, a third arm link  
having a proximal end portion pivotally connected to  
the second arm link, and a fourth arm link having a  
10 proximal end rotatably connected to the distal end of  
the third arm link.

19. An apparatus as defined in Claim 18,  
wherein said base further includes a plurality of  
support surface registering members each having a  
support surface contact member and a hydraulic engaging  
5 member connected to the support surface contact member  
for hydraulically engaging the support surface contact  
member with the support surface.

20. An apparatus as defined in Claim 19,  
wherein said aircraft maintenance tool includes at  
least one of the following: an aircraft deicing tool  
and an aircraft cleaning tool.

21. An apparatus as defined in Claim 20,  
wherein said aircraft cleaning tool includes a tool  
housing, a pair of cleaning brushes having at least  
portions thereof mounted in said tool housing, and  
5 driving means connected to said tool housing for  
rotatably driving said pair of cleaning brushes in  
opposite rotational directions.

20250422004

22. An apparatus as defined in Claim 21, wherein said mobile base further has an operator cab for operating the apparatus from said mobile base.

23. An apparatus for maintaining an aircraft, the apparatus comprising:

a mobile base including rotating means for providing rotational movement of said mobile base on a support surface;

a boom member having a proximal end portion rotatably mounted to said mobile base; and

an aircraft maintenance tool connected to a distal end portion of said boom member.

24. An apparatus as defined in Claim 23, wherein said rotating means of said mobile base includes a plurality of wheel members each having an omni-directional vehicle wheel for providing at least forward, lateral, diagonal, and rotational motion of said mobile base.

25. An apparatus as defined in Claim 23, wherein said mobile base includes a plurality of fluid supply tanks for supplying fluid to the maintenance tool, a power source, and a plurality of pumps connected to the power source and positioned in fluid communication with said plurality of fluid supply tanks for pumping fluid to the maintenance tool.

26. An apparatus as defined in Claim 23, wherein said mobile base includes a rotatable platform positioned along an upper end portion thereof, and wherein said boom member includes a first boom arm having a proximal end portion pivotally connected to

the rotatable platform of said mobile base and having a retracted position and an extended position, a second boom arm having a proximal end portion mounted to said first boom arm and having a retracted position and an extended position, and a third boom arm having a medial portion pivotally mounted to the distal end portion of said second boom arm and having a retracted position and an extended position.

27. An apparatus as defined in Claim 26, wherein said boom member further includes a fourth boom arm having a proximal end portion rotatably mounted to a distal end portion of said third boom arm.

28. An apparatus as defined in Claim 27, wherein said fourth boom arm includes a plurality of arm links, the plurality of arm links including a first arm link having a proximal end rotatably connected to the distal end portion of said third boom arm, a second arm link having a proximal end pivotally connected to the distal end of the first arm link, a third arm link having a proximal end portion pivotally connected to the second arm link, and a fourth arm link having a proximal end rotatably connected to the distal end of the third arm link.

29. An apparatus as defined in Claim 23, wherein said base further includes a plurality of support surface registering members each having a support surface contact member and a hydraulic engaging member connected to the support surface contact member for hydraulically engaging the support surface contact member with the support surface.

30. An apparatus as defined in Claim 23, wherein said maintenance tool is rotatably connected to said boom member.

31. An apparatus as defined in Claim 23, wherein said aircraft maintenance tool includes at least one of the following: an aircraft deicing tool and an aircraft cleaning tool.

32. An apparatus as defined in Claim 31, wherein said aircraft cleaning tool includes a tool housing, a pair of cleaning brushes having at least portions thereof mounted in said tool housing, and  
5 driving means connected to said tool housing for rotatably driving said pair of cleaning brushes in opposite rotational directions.

33. An apparatus as defined in Claim 31, wherein the aircraft deicing tool includes a tool housing, a nozzle connected to said tool housing, and nozzle moving means connected to said tool housing for  
5 pivotally moving said nozzle in a first plane and for pivotally moving said nozzle in a second different plane.

34. An apparatus as defined in Claim 23, wherein said mobile base further has an operator cab for operating the apparatus from said mobile base.

35. An aircraft maintenance tool for maintaining an aircraft, the maintenance tool comprising:

- a tool housing;
- 5 a pair of cleaning brushes having at least portions thereof mounted in said tool housing; and



driving means connected to said tool housing for rotatably driving said pair of cleaning brushes in opposite rotational directions.

36. An aircraft maintenance tool as defined in Claim 35, wherein each of said pair of cleaning brushes includes an inflatable roller and a roller cover, said roller cover including a plurality of brushing members associated therewith.

37. An aircraft maintenance tool as defined in Claim 36, further comprising roller inflating means connected to said tool housing for inflating each of said inflatable rollers.

38. An aircraft maintenance tool as defined in Claim 35, further comprising fluid supplying means connected to said tool housing for supplying fluid to an aircraft for cleaning thereof.

39. An aircraft maintenance tool as defined in Claim 38, wherein said fluid supplying means includes a plurality of fluid supply lines connected to an inner surface of said tool housing and a fluid supply connected to said plurality of fluid supply lines.

40. An aircraft maintenance tool as defined in Claim 35, further comprising suctioning means connected to said tool housing for suctioning fluid from an aircraft adjacent the maintenance tool.

41. An aircraft maintenance tool as defined in Claim 40, wherein said suctioning means includes a suction wiper positioned between said pair of cleaning

405230 04502

brushes and a suction hose connected to said suction  
5 wiper.

42. An aircraft maintenance tool as defined  
in Claim 35, wherein said driving means includes at  
least one motor positioned within said tool housing and  
positioned between portions of said pair of cleaning  
5 brushes mounted in said tool housing.

43. An aircraft maintenance tool as defined  
in Claim 42, wherein said driving means further  
includes a drive assembly connected to said at least  
one motor and at least one end of each of said pair of  
5 cleaning brushes.

44. An aircraft maintenance tool as defined  
in Claim 43, wherein said motor includes a drive shaft,  
wherein each of said pair of cleaning brushes includes  
a cleaning brush drive gear, and wherein said drive  
5 assembly includes a first drive gear mounted to said  
drive shaft, a first drive belt connected to said first  
drive gear and one of said cleaning brush drive gears  
for driving the one of said pair of cleaning brushes, a  
second drive gear operatively engaging said first drive  
10 gear, and a second drive belt connected to said second  
drive gear and the other one of said cleaning brush  
drive gears for driving the other one of said pair of  
cleaning brushes in the opposite rotational direction  
from the one of said pair of cleaning brushes.

45. A maintenance tool comprising:  
a tool housing;  
a pair of roll members having at least  
portions thereof mounted in said tool housing; and

- 5 driving means connected to said tool housing for rotatably driving said pair of roll members in opposite rotational directions.

46. A maintenance tool as defined in Claim 45, wherein each of said pair of roll members includes a roller and a roller cover, said roller cover including a plurality of surface contact members  
5 associated therewith.

47. A maintenance tool as defined in Claim 46, wherein each of said rollers are inflatable, wherein the plurality of surface contact members comprises brushing members, and wherein the tool  
5 further comprises roller inflating means connected to said tool housing for inflating each of said inflatable rollers.

48. A maintenance tool as defined in Claim 45, further comprising fluid supplying means connected to said tool housing for supplying fluid to an item for cleaning thereof.

49. An aircraft maintenance tool as defined in Claim 48, wherein said fluid supplying means includes a plurality of fluid supply lines connected to an inner surface of said tool housing and a fluid  
5 supply connected to said plurality of fluid supply lines.

50. A maintenance tool as defined in Claim 49, further comprising suctioning means connected to said tool housing for suctioning fluid from an item adjacent the maintenance tool.

51. An aircraft maintenance tool as defined in Claim 50, wherein said suctioning means includes a suction wiper positioned between said pair of roll members and a suction hose connected to said suction wiper.

52. A maintenance tool as defined in Claim 45, wherein said driving means includes at least one motor positioned within said tool housing and positioned between portions of said pair of roll members mounted in said tool housing.

53. A maintenance tool as defined in Claim 52, wherein said driving means further includes a drive assembly connected to said at least one motor and at least one end of each of said pair of roll members.

54. A maintenance tool as defined in Claim 53, wherein said motor includes a drive shaft, wherein each of said pair of roll members includes a roll member drive gear, and wherein said drive assembly includes a first drive gear mounted to said drive shaft, a first drive belt connected to said first drive gear and one of said roll member drive gears for driving the one of said pair of roll members, a second drive gear operatively engaging said first drive gear, and a second drive belt connected to said second drive gear and the other one of said roll member drive gears for driving the other one of said pair of roll members in the opposite rotational direction from the one of said pair of roll members.

55. An aircraft maintenance tool for maintaining an aircraft, the maintenance tool comprising:

4052730 "044502

5 a tool housing;  
a nozzle connected to said tool housing; and  
nozzle moving means connected to said tool  
housing for pivotally moving said nozzle in a first  
plane and for pivotally moving said nozzle in a second  
different plane.

56. An aircraft maintenance tool as defined  
in Claim 55, further comprising a deicing fluid supply  
line connected to said nozzle and a deicing fluid  
supply connected to said deicing fluid supply line for  
5 supplying deicing fluid to said deicing nozzle.

57. An aircraft maintenance tool as defined  
in Claim 55, wherein said nozzle moving means includes  
a first pneumatic cylinder connected to said tool  
housing for operatively moving said nozzle in the first  
5 plane and a second pneumatic cylinder connected to said  
tool housing for operatively moving said nozzle in the  
second different plane.

58. A method of maintaining an aircraft, the  
method comprising the steps of:  
rotating a boom member connected to a base;  
extending the boom member from a retracted  
5 position; and  
rotating an aircraft maintenance tool  
connected to the boom member during operation of a  
maintenance procedure upon an aircraft.

59. A method as defined in Claim 58, further  
comprising rotating the base about a support surface.

60. A method as defined in Claim 59, further  
comprising moving the base in at least forward,

lateral, diagonal, and rotational directions about the support surface.

61. A method as defined in Claim 58, further comprising supplying fluid to the maintenance tool and suctioning fluid from the maintenance tool.

62. A method as defined in Claim 58, wherein said base further includes a plurality of support surface registering members each having a support surface contact member and a pneumatic engaging member connected to the support surface contact member, the method further comprising pneumatically engaging the support surface contact member with the support surface.

63. A method as defined in Claim 58, wherein the aircraft maintenance tool includes at least a pair of roll members, and the method further comprising rotatably driving the pair of roll members in opposite rotational directions.

64. A method as defined in Claim 58, further comprising remotely operating the base, the boom member, and the maintenance tool.

65. A method as defined in Claim 58, further comprising operating the base, the boom member, and the maintenance tool with an operator positioned on the base.

66. A method of treating a surface, the method comprising:

providing a pair of roll members having surface treating means associated therewith; and

405230-01502

5

rotationally driving the pair of roll members in opposite rotational directions.

67. A method as defined in Claim 66, wherein each of the pair of roll members includes a roller and a roller cover, the roller cover including a plurality of surface contact members associated therewith.

68. A method as defined in Claim 67, wherein each of the rollers are inflatable, and wherein the method further comprises inflating each of the inflatable rollers.

69. A method as defined in Claim 66, further comprising supplying fluid to an item for cleaning thereof with the pair of roll members.

70. A method as defined in Claim 69, further comprising suctioning fluid from an item adjacent the maintenance tool.

71. A method as defined in Claim 70, wherein the step of suctioning fluid includes suctioningly wiping fluid positioned between the pair of roll members.

72. A mobile vehicle, the mobile vehicle comprising:

a base having at least upper and lower portions;

5 a drive connected to said base; and  
a plurality of wheels connected to a lower portion of said base and connected to said drive so that said plurality wheels responsively move said base in at least three different directions responsive to

- 10 said drive, each of said wheels including a hub and a plurality of roller members dispersed around said hub.

73. A mobile vehicle as defined in Claim 71, wherein each of said plurality of wheels is drivable responsive to said drive in a selected direction independent of each of the other plurality of wheels.

74. A mobile vehicle as defined in Claim 73, wherein said lower portion of said base includes a plurality of recessed regions into each of which one of said plurality of wheels is mounted.

75. A mobile vehicle as defined in Claim 74, further comprising a plurality of auxiliary maintenance modules connected to the upper portion of said base.

76. A mobile vehicle as defined in Claim 75, wherein the plurality of auxiliary maintenance modules are positioned along peripheral edges of said base.

77. A mobile vehicle as defined in Claim 76, further comprising at least one main maintenance module connected to the upper portion of said base and having a maintenance tool connected thereto.

78. A mobile vehicle as defined in Claim 77, wherein said at least one main maintenance module further includes a module base portion, a boom arm portion rotatably connected to said module base portion, and the maintenance tool being connected to said boom arm portion, said boom arm portion being extendable between retracted and extended positions.
- 5

4052730-01902



79. A mobile vehicle as defined in Claim 77,  
further comprising retractable and extendable  
connecting means positioned between and connected to  
the upper portion of said base and said main  
5 maintenance module for retracting and extending said  
main maintenance module.

80. A mobile vehicle as defined in Claim 77,  
wherein at least either one of said plurality of  
auxiliary maintenance modules or said main maintenance  
module includes a chamber having at least one  
5 maintenance fluid positioned therein.

81. A mobile vehicle as defined in Claim 72,  
further comprising a plurality of leveling legs  
connected to said base for leveling said base in  
selected positions, said plurality of leveling leg  
being movable between retracted and extended positions.

